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enthusiasm the young men go away to be like centers of enthusiasm for others." It is a high and noble ideal, and one towards which we are all most heartily ready to strive; but it is rather difficult to follow the logic of the conclusion that a fellowship system tends to destroy this ideal. It would be invidious to refer to particular men or universities had not Dr. Jordan himself set the example by naming, among others, four eminent teachers at one university who exemplify the ideal he has in mind. It is entirely true that these men drew students about them by the force of their ability and personality; but is it not also true that the university which placed them on its faculty did more than any other American university had previously done, by a system of wisely administered fellowships, to make such a gathering of students possible? It was my own good fortune to be one of those students, and I count it not only as a lasting honor but as the most important turning point in my life that appointment to a university fellowship enabled me to place myself under the inspiring influence of three of the four men whom Dr. Jordan names. I am sure that many others whose after lives have been given to teaching and research can bear like witness.

Dr. Jordan argues that it would be a difficult task to produce a Darwin, given the raw material, "if a fellowship of \$500 had drawn him to a laboratory of some lesser plodder." But what does this prove if not the desirability of trying to widen the usefulness of the gifted teacher by making it easier to gather students of promise about him, and by helping such students as well as we can to the opportunity they seek? Happily for science, the circumstances of the youthful Darwin placed him beyond the need of such aid. He was free to "walk with Henslow" (to quote Dr. Jordan's own happy phrase); but had it been otherwise, who can estimate the value to the world of a helping hand to Darwin at a critical moment? We are sometimes told that fellowships tend to "pauperize" students. I do not believe it. All honor to the man who works his own way through college and university life. But the years of graduate study,

perhaps above all others, ought to be a time of undisturbed and unremitting devotion to one's chosen work. The man whose ability and scholarship have proved him worthy to enjoy the privilege of at least one such year is in no danger of pauperization by the fellowship that gives him the opportunity. If he has been well chosen, his stipend is as well earned as that of any officer of the university. In my belief the university makes no better investment than the \$500 a year that enables the man of talent, but of limited means, to carry on his work, and the example and influence of such men among the body of graduate students constitute one of the best assets of the university.

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COLUMBIA UNIVERSITY,

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SCIENTIFIC BOOKS

A Text-book of Botany for Colleges and Universities, by members of the botanical staff of the University of Chicago, JOHN MERLE COULTER, Ph.D., Professor of Plant Morphology; CHARLES REID BARNES, Ph.D., late Professor of Plant Physiology; HENRY CHANDLER COWLES, Ph.D., Professor Plant Ecology. Vol. I., Morphology and Physiology. New York, Cincinnati and Chicago, American Book Company. 8vo. Pp. viii + 484 + 12.

When Strasburger with his colleagues in the University of Bonn brought out a text-book of botany it was promptly named the "Bonn Text-book," following which precedent it has been suggested that the book before us should be named the "Chicago Text-book." And this American book promises to be a worthy rival of its German predecessor, which no doubt it will replace in many college and university classes. When complete, the book will include morphology, physiology and ecology, but for some reason not stated in the preface, only the first and second are now published. Probably that will follow before long, as some reference is made in the preface to "Part III." as at least partly prepared for publication.

The book is doubly interesting in that it

presents a certain amount of organized information in regard to a portion of the science of botany, and also that it gives us the result of ten years of experience in working out the method of undergraduate instruction in botany in one of the foremost botanical laboratories in the country. The authors here endeavor to present "the fundamental facts and principles of the science," and they hold that these should precede the work of most other subdivisions of botanical investigation. Thus they point out that "a study of the very important subject of plant pathology must presuppose the fundamentals of morphology and physiology; paleobotany is, in part, the application of morphology and ecology to fossil plants; and scientific plant breeding rests upon the foundations laid by morphology, physiology and ecology."

Here we have then an expression of the opinion of three eminent teachers as to what should be the "content" of botanical instruction, and its proper sequence, and it is that the structure of plants must be presented first in an orderly sequence from the lower to the higher forms, and that then the activities of plants must be considered, while the relations of plants to one another and to their physical environment may well come after form and function have been pretty fully considered. Then when these fundamental subjects have been pretty well mastered the student is ready to go forward into pathology, paleobotany, plant breeding, etc. The book is thus a contribution to botanical pedagogy. This aspect of the book is, we believe, most important at this time when some teachers have the notion that it makes little difference in what order the subdivisions of botany are taken up.

The morphological part plunges at once into a study of the *Thallophytes*, taking in succession (1) *Myxomycetes*, (2) *Schizophytes*, (3) *Algæ*, (4) *Fungi*, followed by *Bryophytes*, *Pteridophytes* and *Spermatophytes*, and a suggestive chapter entitled "Organic Evolution." The treatment is admirable, and the more than six hundred illustrations make this one of the most satisfactory morphological texts with which we are

acquainted. The student who runs up through the vegetable kingdom in the sequence here given can not fail to secure a clear conception of its general plan, as well as of its probable mode of evolution.

The second part, devoted to *Physiology*, takes up the subject under five heads, viz., (I.) the material income of plants, (II.) the material outgo of plants, (III.) nutrition, (IV.) destructive metabolism, (V.) growth and movement. The treatment here is as satisfactory as in Part I., and as we read the lucid sentences we are reminded forcibly of the great loss suffered by botanical science through the death of Professor Barnes. We can not refrain from quoting a few sentences, both for the substance and as illustrating the forcible presentation.

Transpiration, far from being a function of plants, is an unavoidable danger. That it is a danger, a real menace to life, is almost a matter of common observation. Millions of plants perish annually because the outgo of water is greater than the income. A loose soil and an exposed situation, sudden extreme evaporation due to a hot dry wind and a blazing sun, or prolonged drought, are causes of death too well known to farmers in some regions. Scarcely a plant escapes the loss of some parts by reason of shortage in the water supply; and in temperate regions, with the average rainfall (say 100 cm. annually), few plants attain the development of which they are capable with a larger water supply. The luxuriant weed of well-watered ground compared with the same weed, meager and dwarfed on the dry wayside, illustrates what a menace to life and vigor is the evaporation from plants.

It is greatly to be deplored that the facile hand that penned, and the active and original mind that framed such vigorous and lucid sentences are forever stilled, and that the work here so well begun must stop, or be carried forward by others. And who is there who can take the place of Barnes?

CHARLES E. BESSEY

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Attention and Interest: A Study in Psychology and Education. By FELIX ARNOLD, Ph.D. New York, The Macmillan Company.